EQ-LINK SYSTEM
&
EQ1 WIRELESS
AVIATION HEADSETS

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1. INTRODUCTION

1.1. About This Manual

The main purpose of this manual is to provide information to ensure the optimum use and performance of the EQ1 Link Wireless Aviation headset system.

It also provides advanced information for users who require extra functions other than those supplied “out of the box”. This manual also contains programming data that refers to option products that the EQ1 headset can be used with.

1.2. Glossary of Terms

VOX	Voice Operated Switch *This is a mechanism whereby the voice sounds trigger an electronic switch to turn a circuit on, usually it links the microphone to the transmitter or other headsets.*
SIDE TONE	*This is the small amount of your own voice that you hear in your own ears when talking.*
ANC	Active Noise Cancellation *This process used electronic circuits to reduce the sounds that you hear in your own ear from external noise.*
AEC	Active Echo Cancellation
Hz	Hertz (measure of frequency)
ID	Identification
kHz	Kilohertz (measure of frequency)
MHz	Megahertz (measure of frequency)
PSU	Power Supply Unit
PTT	Press To Talk
DSP	Digital Signal Processor

2. FUNCTIONAL OVERVIEW

Thank You for purchasing the EQ1, EQ-Link system.

The EQ-Link Wireless Aviation Headset system is a state of the art audio communication device specifically designed for Aviation headset applications in high noise environments.

The EQ-1 Headset includes re-chargeable batteries and active noise cancelling circuits for optimum listening pleasure. The headset features only essential controls to ensure ease of operation. Advanced configuration and operations can be accessed using the simple voice menu controls.

The development of the EQ1 Wireless Communications system represents a significant breakthrough in the field of high noise communications without wires.

The technical specification of the EQ1 will enable reliable communications up to distances of 30 feet (about 10 meters), depending on conditions. In addition, the EQ-1 transceiver incorporates superior signal handling capability, which ensures excellent reception even in the most crowded radio environments.

In short, this revolutionary new system incorporates the very latest in RF design technology, making the EQ-1 the most versatile, high performance wireless headset communications solution available suitable for high noise open and closed cockpit applications.

2.1. System Features

The system includes the following functionality:

- Full voice annunciation system for ease of user interface navigation and control.
- Individual Headset Volume and VOX controls to suit the user.
- Voice priority of programmed headset (Pilot, Co-Pilot, Passenger).
- Peer to Peer Operation for use without Base Controller or EQ-Link.
- Auto Muting of Auxiliary audio inputs during VHF reception.
- Auto VOX open on PTT for no loss of voice conversations.
- Wireless EQ-Link for ease of installation in Aircraft.
- Optional MP3/Cell Phone (Bluetooth) Interface.

EQ-1 HEADSET

EQ-LINK MODULE

3. BASIC OPERATION

The EQ1 uses a simple '***PRESS***' and '***ROTATE***' system to navigate through the various setting using the multi function knob on the left side of the headset.

3.1. Turning Headset ON and OFF

To turn the headset **ON** press and hold the knob for 2 seconds. You will be 'introduced' to the headset, and a voice prompt will announce "hours of battery life" remaining.

The EQ1 will produce an audible beep every 5 seconds until its "paired" EQ-Link unit is located. (Note the EQ-Link must be turned on. The EQ1 and EQ-Link have been paired at the factory If more information on pairing is needed please refer to section XXX for EQ-Link pairing) If your unit detects an EQ-Link that it is not paired with, then a low tone will be heard and the headset will continue to look for your paired device.

Once the paired EQ-Link is detected you will hear a voice prompt "XXXX" You can then operate the EQ1 headset as you would any conventional aviation headset. If the EQ1 does not detect its paired EQ-Link, the unit will automatically turn off after 2 minutes.

To turn the Headset **OFF**, press and hold the knob, a count down will then be initiated. (3…..2……1… Battery xx Hours). When the message "***HEADSET OFF***" is heard the knob can be released. Or turn off the EQ-Link and it will signal the EQ1 headset to power down as well

3.2. Volume Adjustment

The volume is adjusted by rotation of the knob, to increase rotate clockwise and to decrease wind anti-clockwise, the volume level setting will be announced with a voice prompt. The volume has been factory preset to a level of 4.

Increase and decrease by rotating the knob one click at a time and listen to the voice prompt to announce volume level setting.

3.3. Menu Mode

PRESS The KNOB 3 TIMES

The Headset will then speak "***MENU MODE***".

When this is performed the headset enters the Voice Menu System, Note: *if no more actions take place then the headset will exit the menu system after 10 seconds.*

Rotate the knob for:

"VOX SETTINGS, CONFIGURATION and ADVANCED" *(please refer to the flow chart on page XX for other menu setting instructions)*

Press knob to confirm menu selection

When the EQ1 is in the VOX menu the knob can be rotated to select the value and sensitivity of the VOX circuits, a higher number means a louder voice is required to activate the VOX system.

"ONE, TWO, THREE……..TEN"

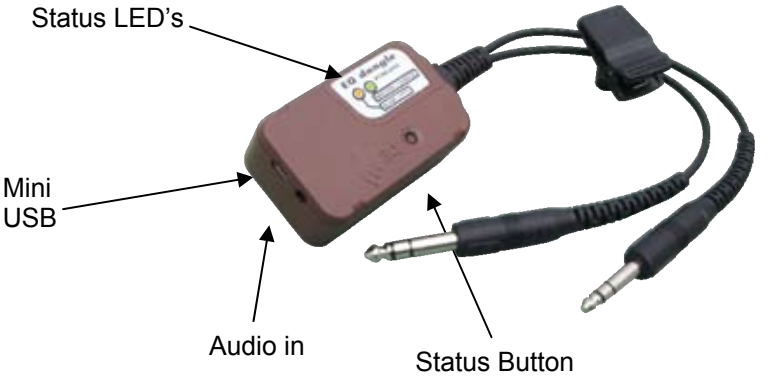
When the desired VOX setting is reached press the knob to save and confirm the setting.

The headset will then automatically leave the menu system and return to normal operation.

3.4. EQ-Link Controls

The EQ-Link has a number of controls and system inputs, these are described below:

Mini USB	Used for charging.
3.5mm Audio	User for Cell Phone/Blue Tooth or MP3 player.
Status Button	Used to read battery capacity, transmitted to headset.
	Used also to change mode from Master to Slave.
	Used to enter Menu Mode for advanced features.
Status LED's	Green is used for charging indication and Master Indication.
	Yellow is used for PTT indication and Slave Indication.



4. ADVANCED OPERATION (HEADSET MODE)

4.1. Headset Mode

Enter the programming voice menu as above.

Rotate the knob for:

"CONFIGURATION"

Press knob to confirm the menu selection.

Rotate the knob for:

"MASTER, PILOT, CO-PILOT, PASSENGER or EQ-LINK"

Press knob to confirm the menu selection.

The EQ-1 has been factory preset to the "EQ-Link" mode and paired with the EQ-Link module that comes with your kit. The other configuration settings can be disregarded if using as "Link" headset.

When using multiple EQ-1 headset paired to a single EQ-Link module the "passenger" setting should be selected and all other settings can be disregarded. Also please read the section "multiple headset configuration and settings" section on page 11

5. SYSTEM FUNCTIONS

5.1. EQ-Link

The EQ-Link is the heart of your headset system that wirelessly connects the EQ-1 headsets and provides the interface for your radio and communications system.

The EQ-Link must be plugged into an intercom system and will power on when your aircraft's communication system is energized.

5.2. EQ-Link Pairing

The EQ-Link has been paired at the factory with the supplied EQ-1 headset. No other adjustments are required.

However if you wish to pair a headset to a new EQ-Link:

Enter Advanced menu mode and select "pairing" from the advanced menu settings (refer to the flow chart section 10.1)

Power the EQ-Link. Either plug the link into your intercom inputs in the aircraft or by plugging the mini USB charging cable in an appropriate power source (USB port on your P.C. or supplied 12 volt adapter)

Ensure that the EQ-Link that you wish to pair to is set to Master.(*see P13*)

The headset should then detect the EQ-Link and announce the last 4 digits of the serial number of EQ-Link. This serial number can be found on the back to the EQ-Link. If this is the correct unit as indicated in the headset then press the button on the headset to confirm.

Your headset is then paired to this EQ-Link and will only link to this unit when in "Link" or "passenger" mode.

5.3. Multiple Headset Configuration and Pairing

EQ-Link will allow multiple EQ-1 headsets to be paired to the same EQ-Link module. ***It should be noted that the multiple headset configuration is intended for passenger communications only and should be plugged in to a "passenger" input on the intercom system. EQ-Link operates in a semi duplex mode and does not have the ability to distinguish between pilots and passengers. Plugging an EQ-Link with multiple paired headsets in a pilot input could potentially interfere with important VHF communications.***

For optimum performance all EQ-1 headsets should be set to "passenger" setting as described Section 4.1 "Headset Mode"

Each EQ-1 headset will need to be paired to the EQ-Link module as described in Section 5.2 "EQ-Link Pairing"

5.4. PTT Detection

The EQ-Link can detect when the aircraft PTT is activated, this is indicated by the YELLOW LED going fully on. This can aid in the detection of PTT Faults and also as a general PTT indication.

On each PTT press a short tone (BEEP) will be heard in the headset and when PTT is released a short tone (BOP) will also be heard. We call these comfort tones and they give feedback that you really have pressed and released the PTT button in the aircraft.

Note: ***only available when aircraft's headset sockets are wired for PTT***

The VHF radio system has override priority and will mute all other ancillary inputs such as MP3, cell phone UHF etc; when a PTT signal is detected on this input. Some aircraft may not have this active on the headset sockets and hence this feature will not work.

5.5. Optional MP3 or Cell Phone Interface

The EQ-Link has additional inputs suitable for Cell or MP3 type connections, these are available on the 3.5mm connector at the end of the EQ Link.

Note:

During VHF reception 3.5mm Audio input is muted to the headsets, this will always enable clear reception of all VHF radio traffic.

An optional EQ-1 Blue Tooth Module specially designed to suit the EQ-1 System is available for Cell phone interface. When using this module ensure that the module is mounted at least 400mm away from the EQ Link to avoid RF interference. Usually the Blue Tooth module should be positioned in an accessible area of the aircraft.

5.6. EQ-Link Communications Settings

The EQ-Link will function at peak performance when the aircrafts communications settings can be adjusted to suit. The EQ-Link acts as a cable replacement for standard Headsets and as such will receive any imperfections in the aircraft communications system. The extra quietness of the EQ1 system means that some electrical noises that may not have been heard with other headsets may now become audible.

Advanced features can be activated on the EQ-Link to further assist the noise reduction performance of the system. These modes are activated by 3 fast clicks of the STATUS button on the EQ-Link. These modes will be announced on the paired headset for ease of use and understanding of the functions performed.

Standard Modes include improved noise cancelling DSP algorithms.

The graph below shows a cockpit recording in a typical light aircraft. It highlights the difference with noise reduction off to the left and noise reduction on to the right. The dense bits in the middle are aircraft noise.

6. INSTALLATION

6.1. Installation EQ-Link

The EQ-Link system is supplied with a standard aviation cables and connectors (jacks) to suit standard aviation connections. The EQ-Link system will automatically power ON when the aircraft communications system is turned on, and will automatically power off when the communications is switched off. A permanent optional charge cable can be connected for peace of mind to ensure the EQ equipment is always charged.

When you aircraft communications is switched off the EQ-Link and EQ1 Headset will automatically power OFF.

Simply connect your EQ-Link into where your normal headset would be connected. The EQ-Link is supplied with Velcro for simple mounting and a cable clip for additional support. For additional performance operation when multiple EQ-Link modules are used on one aircraft simply set extra units to SLAVE mode. In this mode all the units will operate as one and not interfere with each other, their must be at lease one master in all systems.

Slave mode can be entered by pressing and holding the STATUS button for 4 seconds, the LED lights will then change every 2 seconds from Master to Slave and announce this in the headset. When on the desired mode, just release the button.

NOTE: *A typical aircraft can only have one master and up to 5 slaves in the single system for peak performance, in the case of more units please contact your supplier for additional information on your options.*

YOUR INSTALLATION IS NOW COMPLETE……

7. HEADSET / EQ-LINK CHARGING

The EQ1 Headsets and EQ-Link have the most advanced battery monitory and charging system of any headset system on the market today, this ensures that your flying will be trouble free and you are able to judge the operational time of your headsets correctly.

The headsets and EQ-Links are fitted with the latest NiMh low loss technology. These batteries will lose approximately 1% of their stored charge per month when not in use. Fully charged, the headsets will provide up to 28 hours of in flight use, and up to 35 hours for the EQ-Link system.

NOTE: The built in charge capacity indicator accuracy will diminish and not provide accurate indications of headsets and EQ-Links that are stored for extended periods of time. Simply re-charge the system to bring back to full accurate capacity.

The headsets and EQ-Link can be charged from the supplied wall charger by simply plugging the connector into the headset socket, this will automatically power the units on and begin the charging process. This charger can charge 2 headsets or 2 EQ-Links at the same time. Every minute the headset will announce the state of charge as a percentage of charge accumulated. This can also be gauged at any time by briefly pressing the ON/OFF control knob. From completely discharged the headsets should take approximately 8 hours to charge.

The EQ-Link has a green LED to show charge status, this system will blink faster as the charge gets to 100%. Full charge is when the green LED is fully on. When in operation the brief pressing of the button on the EQ-Link will also announce the charge status of the EQ-Link in the paired headset speaker.

When the systems are fully charged they will go into a preserve mode to keep the batteries at a fully charged state with no overcharging. When charging is complete you can just remove the power and the headsets will automatically turn off or keep in operation for in flight use.

The Headsets and EQ-Link system can also be in-flight charged for safe uninterrupted operation with the optional USB charging adaptor.

When the remaining battery capacity falls to 20%, (approx 5 hours flight duration) the headsets will announce a “Low Battery Capacity” warning every few minutes.

8. HINTS AND TIPS ON OPERATION.

Make sure that the headset and EQ-Link units have fully charged batteries.

Make sure the EQ-Link is not behind metal walls in the aircraft as this will limit the effective range of the system.

Make sure the VHF antenna or other high powered transmitters are a least 2 meters from the headset system. If the VHF antenna is too close to the headset then Radio frequency feed back will occur in the headset when transmitting on VHF. This will result in an echo like feedback in each headset and live echo on VHF transmit frequencies.

Set the VOX operation to suit the noise profile of the Aircraft, a high noise aircraft like a micro-light in full climb out may require a headset VOX setting of 6 to 8.

Ensure the correct position of the EQ1 microphone, one finger width from the mouth. This is very important for correct operation. Make sure you are speaking into the correct side on the microphone. This is marked with ***"EQ"*** and should face the mouth. As this system is designed for high noise, all noises away from the microphone are attenuated. Getting the microphone in the correct position is VERY IMPORTANT.

Set the VHF Radio Squelch OFF and listen to the noise, then adjust the VHF radio Volume for a comfortable level. Reset the VHF radio squelch as required. The overall volume of all conversations and the VHF radio can then be controlled on each headset and the aircraft communications module to suit the user.

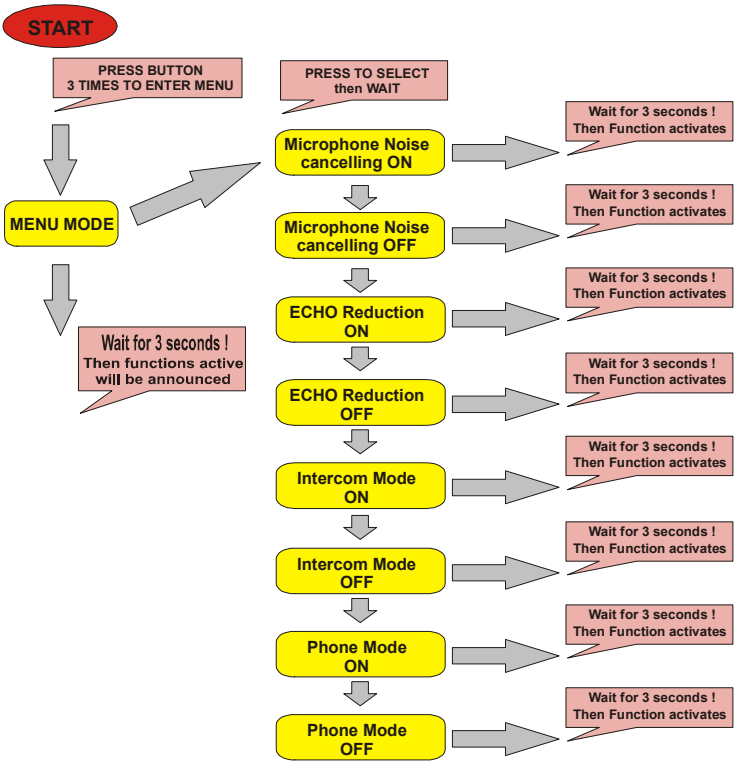
NOTE: *it is recommended that you turn the aircraft's communications system VOX (or squelch) system off or low, as the headsets will now control this for you.(** In the case of multiple EQ1 systems)*

Your EQ1 and EQ-Link system will come from the factory already paired, if this is required to be done again or you have purchased an EQ-Link separately, follow the paring steps on page 10.

DO NOT LEAVE YOUR HEADSET IN FULL SUN OR CLOSED HIGH TEMPERATURE ENVIRONMENTS.

9. VOICE MENU PROGRAMMING EQ-LINK.

9.1. EQ-LINK



The tree diagram shows how to program each of the sections of the EQ Link.

Voice guides will help navigate through the menu system, if unsure the system will time out and return to normal operation after 5 seconds. If a mistake is made it can be reprogrammed.

If no function is selected after entering menu mode then the current system status will be announced and the menu will exit.

9.2. Microphone Noise Reduction

The microphone noise reduction when activated will add extra DSP processing of the signal from the headset microphone to the Intercom system. This algorithm will remove constant noise signals in the background and process the voice to remove noise components. Some loss in signal richness is expected when this mode is activated. Large gains in signal to noise performance is expected when using this is very noisy aircraft.

9.3. Echo Reduction

The EQ Wireless system uses digital transmission of audio data packets to send and receive information. This technique causes a small delay of the audio stream from one end of the system to the other. In some cases the internal intercom system of the aircraft also has processing delays. When these delays add up to a certain point the user will get an effect of delayed side tone, and this will sound like an echo of yourself in you own ear. When the echo is large and the user is uncomfortable with the sound you will need to switch the EQ Link into echo cancelling mode to reduce this effect. When in this mode the EQ headsets will provide the side tone for the user and not use the side tone provided by the intercom system.

9.4. Intercom Mode

When the EQ Link is operated in this mode, the EQ Link will provide a return path or side tone path of the audio that is sent to the EQ Link from the Headsets. This mode is used when the system that the EQ Link is plugged into has no side tone. This often happens when used in Hand Held Radio systems as they have no side tone until the PTT is pressed.

9.5. Phone Mode

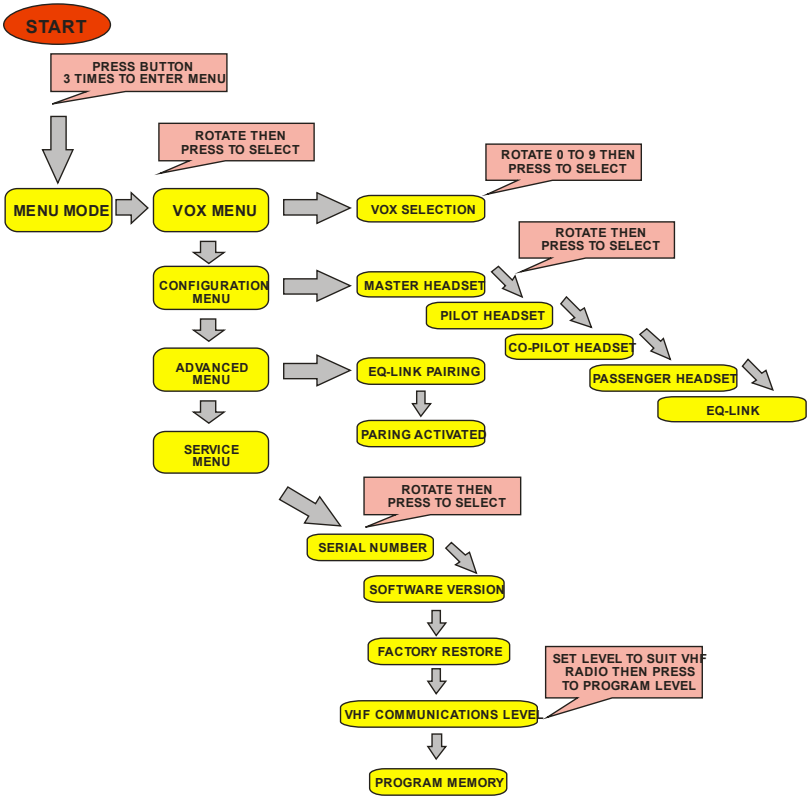
Use this mode when you want full duplex communications from the 3.5mm audio connector on the EQ Link. Normally the EQ Link will mute signals the come into the EQ Link on this connector when VHF Radio traffic is being received. When turned on and connected into a cell phone then normal conversations can take place in full duplex.

Voice guides will help navigate through the menu system, if unsure the system will time out and return to normal operation after 5 seconds. If a mistake is made it can be reprogrammed.

If no function is selected after entering menu mode then the current system status will be announced and the menu will exit.

10. VOICE MENU PROGRAMMING HEADSETS.

10.1. EQ-LINK MODE



To enter pairing mode, the Headset must have first been set to EQ-Link mode.

The paring mode voice menu will then become available to enable pairing.

NOTE:

The VHF communications LEVEL is like MIC Gain on standard headsets and can be programmed from the Pilot or EQ-Link Headset ONLY to the Base or EQ-Link Controller, the Headset must be linked at this time to perform the operation.

11. DEVICE SPECIFICATIONS

	GENERAL
Frequency	2.4GHz ISM Band frequency hopping
RF Power	1mW, 0dBm
	EQ-Link
DC Power	5-18volts DC for charging
Current	400mA Max
Input Audio	Nominal 1000mVpp
Output Audio	Nominal 150mVpp
	HEADSET
DC Power	Batteries AA, 2 units NiMh low loss
RF Power	1mW, 0dBm
Charge	+5 volt only 400mA max

12. LEGAL

ONE YEAR LIMITED WARRANTY

Lysar Industries warrants this product is to be free from defects in material and workmanship under normal and proper use, for the period on ONE YEAR from the date of original purchase and agrees, at its option, to repair or replace such parts showing factory defects to the following provisions:

This Warranty applies only to a new product, which has been sold through authorized channels of distribution. The purchaser voids the warranty if he or other not authorized Lysar Industries attempt to repair or service the unit, or if any parts are not supplied by Lysar Industries are inserted in the unit. Defective products or parts must be returned to the point of sale. This warranty does not cover cable breakages or any breakages caused by normal wear and tear. THE FOREGOING IS YOUR SOLE REMEDY FOR FAILURE IN SERVICE OR DEFECT, LYSAR INDUSTRIES SHALL NOT BE LIABLE FOR UNDER THIS OR ANY IMPLIED WARRANTY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. This warranty is in lieu of all other warranties, express or implied, INCLUDING THE WARRANTY OR MERCHANTABILITY OR FITNESS FOR USE, WHICH WARRANTIES ARE HEREBY EXCLUDED.

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions;

1/ This device may not cause harmful interference and

2/ This device must accept any interference received, including interference that may cause undesired operation.

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Distributed in the USA by

ATO Aviation

17320 N. Dartford Dr

Spokane, WA 99208

509-731-3153

www.wirelessaviationheadsets.com

e-mail: contact@wirelessaviationheadsets.com